

## Letter from Alexander Graham Bell to Mabel Hubbard Bell, November 4, 1896, with transcript

ALEXANDER GRAHAM BELL TO MABEL (Hubbard) BELL Beinn Bhreagh, C. B.  
Wednesday, November 4, 1896. My darling little wife:

Many thanks for the telegrams for sent concerning the results of the Election. The Dunlaps were at the Telegraph Office until midnight. Both, Mr. Kennan and I, received telegrams long after the usual hour of closing. I felt so sleepy about 10 o'clock that I went upstairs to take a nap intending to get up about midnight to read the mail — hear the latest news and etc. Mr. Ellis kept watch on the telephone during my absence. Mr. McCurdy was absent at Mr. Kennan's. I wakened up just at the right time — and heard the good news of McKinley's election confirmed by the latest reports. Felt too tired to write to you or do any work — did not even have go enough to read the papers — so went right back to bed — and slept soundly till 10 A. M. Was at the laboratory by eleven. Have been making great progress there. The conditions for a vacuum—lift are becoming clearer all the time — and I feel that I have made a great discovery. I am tired tonight — and want to write out some instructions for Mr. Ellis so will stop now — for the present. May explain details more fully by and by. You remember how excited I was when I got my first lift of 61 grammes with a little bit of tin beat round under part of propeller.

With the same surface arranged in a very slightly different manner — the lift rose from 61 to 85.6. Then 2 further changes gave 94 grammes yesterday — and today we reached a still higher point 103.2 — with the same amount of surface. Very slight changes of position and etc., make great differences in the lift. One principle comes out clearly — the out—draught must not be obstructed. Everything that tends to dam up the air in the propeller — at once reduces the lift.

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So too the advance of the edge of the semicircle beyond the face of the propeller makes an enormous difference when moved only a very small fraction of an inch. In position 1 the edge a b of the strip is in line with the propeller face. In position 2 it is advanced 0.5 cm. (half a centimeter less than a quarter of an inch). In position 3 it is advanced 1.0 cm. half a centimeter beyond position 2.

My new apparatus (in which I use solid blocks of wood in which the semicircles are out) enables me to make minute adjustments — and the lifts respond. Can reproduce the effects every time. I must stop — till I have finished my notes for Mr. Ellis. More to come.

Have finished “Instructions” so will put in a few more points of progress made.

Cannot take the time to enter into details now. Will try to utilize Sunday for a connected account of progress made. Shall merely say that I am using solid blocks of wood with semicircular space cut out — instead of tin stripe. Not that wood is any better than tin — but the arrangement cannot get out of shape — and can be 3 adjusted in minute particulars with accuracy. Whole thing looks something like an Old Box Telephone without its cover.

Best lift yet obtained (without rotation) — by vacuum — produced by rotation of propeller. I use eight propellers to multiply the indications. Four shove in one direction and the four others in the opposite direction. In this way I eliminate effects produced by horizontal velocity — and can study the vacuum effects by themselves. The propellers rotate — but the machine as a whole is at rest.

Your loving husband, Alec. P. S. Does it not seem strange that such an apparatus as that — (placed upon a balance) — apparently becomes lighter when the propeller rotates! Everything horizontal too. AGB. P. S. No. 2. I have no objection to your showing any of my notes of experiments to Prof. Langley — if he expresses a desire to see them — although

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perhaps it might be better to wait until I can show him a completed series. Do just as you like about this. AGB.